Patent Claims

1. Method for applying manganese phosphate layers to iron or steel surfaces using phosphating solutions containing manganese, phosphate or iron(II) ions as well as nitroguanidine, characterised in that in order to form a manganese phosphate layer having a minimum thickness of 2 μm and an averaged maximum roughness depth (R_z) of 2.5 μm measured after drying, the workpieces are brought into contact with a phosphating solution containing

    0.2 to 4 g/l of iron(II) ions
    10 to 25 g/l of manganese ions
    25 to 50 g/l of phosphate ions (calc. as P_2O_5)
    3 to 35 g/l of nitrate ions
    0.5 to 5 g/l of nitroguanidine

    that has 7 to 24 points of free acid, 50 to 140 points of total acid, as well as an S value of 0.2 to 1.

2. Method according to claim 1, characterised in that the workpieces are brought into contact with a phosphating solution that contains 0.5 to 2 g/l of nitroguanidine.

3. Method according to claim 1 or 2, characterised in that the workpieces are brought into contact with a phosphating solution, that contains at most 2.5 g/l of iron(II) ions.

4. Method according to claim 1, 2 or 3, characterised in that the workpieces are brought into contact with a phosphating solution, that in the case of the treatment of steel, contains a complex-forming agent

for the alloying constituents of the steel, preferably citric acid.

5. Method according to one or more of claims 1 to 4, characterised in that the workpieces are brought into contact with a phosphating solution that additionally contains

0.2 to 4 g/l of nickel ions

or

0.2 to 4 g/l of magnesium ions.

6. Method according to one or more of claims 1 to 5, characterised in that the workpieces are brought into contact with a phosphating solution in which a proportion of the manganese ions are replaced by manganese carbonate in order to neutralise the free acid.

7. Use of the method according to one or more of claims 1 to 6 for workpieces that are subjected to a sliding friction, such as axles, gear mechanism parts and engine pistons.